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ABSTRACT

Two studies were done to explore factors associated with the rate at which students move from one school community to another in the Austin (Texas) Independent School District. The first study sought to learn the demographics of mobile students. The second study examined the relationship between student mobility and achievement. The first study used school records to examine the variables of group (student mobility), low income status, ethnicity, and grade level. Results of data analysis indicate a strong relationship between low-income status and mobility. The second study compared student achievement on a norm-referenced tests. Student records over a period of 13 years were examined. Results indicate that students with higher numbers of moves had lower mean grade equivalents. Overall, the studies establish that there is a relationship among student mobility, income of the students' parents, ethnicity, and the grade level of the students; and that although mobility may not cause lower achievement, it is one factor in students' lives that can negatively affect learning. Includes six graphs. (JB)

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A Study of Urban Student Mobility

by
Vicente Paredes
Austin Independent School District

Paper Presented at the Annual Meeting of the
American Educational Research Association
April 1993, Atlanta, Georgia

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Introduction

This paper will examine factors associated with student mobility in an urban school district. Student mobility is the rate at which students move from one school community to another. This does not include natural moves such as from an elementary school to a middle school in the district tracking pattern, but does include moves from one school district to another, or moves from one school to another school during or between school years.

Interest in the problem of urban student mobility is relatively recent. Studies of rural migrant students have been going on for some time. Migrant students also move from one school to another, but usually in large groups and at predictable times. However, unlike mobile urban students, rural migrant students are a readily identifiable population. In many areas, special programs are in place to serve the special needs of migrant students.

Few studies have addressed the growing problem of urban student mobility. Lash and Kirkpatrick (1990)[1] quote a Department of Commerce statistic which states that nationwide, 19% of school-age children move in a single year.

Students may move within and across urban districts for a number of reasons. A parent might change or lose a job. The student may move from living with one parent to another parent in a divorced couple. A family might move to a more expensive house. Or, a student might be transferred to another school because of behavior problems.

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[1] Lash, A. A., & Kirkpatrick, S. L. (1990). A classroom perspective on student mobility. The Elementary School Journal, 91(2), pp. 177-191.

These types of moves require the student to make new friends and adjust to a new school environment. All of these situations can cause stress in the social and academic life of the student. These new students also create logistical problems for teachers and administrators.

New students coming into a school at times other than the beginning of the year create a need for teachers to reteach material or catch the new students up. Lash and Kirkpatrick (1990)[2] have documented some of the problems that students and teachers face when a new student enters an established classroom environment. For example, new students create classroom management problems because they are not aware of classroom rules and procedures, cooperative learning efforts can be disrupted with the introduction of new students into learning groups, and bookkeeping duties for teachers are increased due to entering and exiting students.

This paper is made up of two studies. The first study is a preliminary effort to describe the population of mobile students in terms of demographic characteristics. This description will give school staff and district administrators information that might be valuable in designing interventions. The second study examines the relationship between student mobility and achievement.

Study 1

Method

The four variables examined in this study are (1) Group - a measure of student mobility, (2) Low-income status (lowinc) - an estimate of the parent's income, (3) Ethnic - the ethnicity of the student, and (4)

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2 ibid.

Level - the grade level of the student. All four variables are categorical, that is, each student was classified according to each of the four variables.

Student mobility was measured by examining the withdrawal and reentry history of each student. This was accomplished by accessing school district records. Each student was classified into one of four categories by examining the schools that the student attended in past years and the schools that the student had entered during the current year of the study.

The four categories are:

(A). Stable over time. That is, no school changes in the current year or previous years other than "natural" moves. A natural move is, for example, a change from elementary to middle school.

(B). Moved during the current year (one or more times) but did not move in previous years.

(C). Did not move during the current year but moved one or more times in previous years.

(D). Mobile over time. That is, moved one or more times in the current year as well as in past years.

The estimate of parents' income was obtained by examining applications for government-funded programs for free and reduced-price lunches in the schools. This is a common but rough estimate of parent income.

Three categories were produced as follows:

(A_FREE). The student, or a sibling of the student, is eligible for a free lunch.

(B_REDU). The student, or a sibling, is eligible for a reduced-price lunch.

(C_NOT). No record of an application, or the student and all siblings are not eligible for a free or reduced-price lunch.

Student records were obtained indicating whether the student falls into one of the following ethnic categories:
(1). American Indian
(2). Oriental
(3). Black
(4). Hispanic
(5). White/Other

Students were categorized by grade level using the following coding scheme:
(1_E). Elementary school
(2_M). Middle school
(3_H). High school
Subjects were all students who were enrolled in the Austin Independent School District during the 1990-91 school year. The data set is presented in Appendix A.

Analysis

The resulting data set was a four-dimensional table of frequencies. These data were analyzed in three stages. The first stage involved an analysis of variance of the frequencies. Cell frequencies were first converted by taking the natural logarithm. Since some cell frequencies (13 of 180) were random zeros, a value of 1 was added to each cell before taking the logarithm. These converted values were used in a four-way analysis of variance. This ANOVA yielded a partial sum of squares (type III sums of squares in SAS) for each variable and all possible interactions. These sums of squares gave a rough estimate of the amount of variance that each effect might account for in the analysis to follow.

The second stage involved two log-linear analyses. First, an independence model was fitted. Using information obtained from the first stage, a symmetric model was fitted to the data. Starting with a null model of independence (the assumption that no relation between the four variables exists) effects were added to the model until the percent increase in G^2 was small. A statistic that indicates the amount of information transmitted among the four variables was also computed. This is a measure of how much the four variables cluster together. Since the data set is large, a SAS computer program was written to compute the values that were substituted into the final formula.

Because the mobility variable was of particular interest, a predictor model was also fitted to the data. This analysis was done in order to find which variables contributed to the prediction of the mobility category. The null model allowed a relation among level, low-income status, and ethnicity, but did not allow a relation between these three variables and the mobility variable. Effects were added to this model until the percent increase in G^2 was small. The information-transmitted statistic, in this case, indicates the amount of information about mobility that we have when level, low-income status, and ethnicity are known.

The third stage involved three correspondence analyses. It was desired to order the mobility categories based upon their relationship with other variables. Although the above methods of analysis investigate how the variables are related to each other, it would be interesting to find out how mobility categories are ordered with respect to the low-income variable and the ethnicity variable. This information would enable us to target interventions more accurately to a potentially mobile population of students. Also, the relationship between ethnicity and the income of the parents was investigated further using correspondence analysis.

Results

Stage 1:

ANOVA results (see Table 1) indicate that the lowinc*ethnic interaction is the strongest. The other two-way interactions are close to each other in strength, except for the level*ethnic interaction.

Table 1
ANOVA

SOURCE	SS
level	36.62
lowinc	81.70
ethnic	474.72
group	202.20
level*lowinc	13.06
level*ethnic	3.34
lowinc*ethnic	22.36
level*group	16.21
lowinc*group	13.22
ethnic*group	16.02
level*lowinc*ethnic	3.14
level*lowinc*group	1.04
level*ethnic*group	4.45
lowinc*ethnic*group	4.34
level*lowinc*ethnic*group	2.24

Stage 2:

A. Symmetric Model:

The two-way interactions were successively added into the model. Table 2 shows that large G^2 gains are made with each addition until the level*ethnic variable is added. In this case there is only a 1% gain. The solid line in the table indicates that the best and most parsimonious model includes the main effects and all the two-way interactions except the level* ethnic interaction. Although the G^2 accounted for by this model is significant, indicating that the model is not a "good fit," 97% of the G^2 of the null model is accounted for. The G^2 gain for other effects are significant but the addition of other effects has a minimal influence on this percentage.

Table 2

Independence Model (symmetric)

Model	G^2	df	gain G^2	Δ df	%
[group][level][lowinc][ethnic]	35503.62	168	-	-	-
+ group*ethnic	32682.49	156	2821.13	12	8
+ lowinc*ethnic	15136.01	148	17546.48	8	57
+ lowinc*group	13820.74	142	1315.27	6	61
+ level*group	5469.23	136	8351.51	6	85
+ level*lowinc	1144.60	132	4324.63	4	97
+ level*ethnic	832.68	124	311.92	8	98
+ level*lowinc*ethnic	753.84	108	78.84	16	98
+ lowinc*ethnic*group	597.33	84	156.51	24	98
+ level*ethnic*group	351.84	60	245.49	24	99
+ level*lowinc*group	81.26	48	270.58	12	99
+ levels*lowinc*ethnic*group	0	0	81.26	48	100

The relative information transmitted for this model was computed from the average uncertainties. The average uncertainty H(A) is defined as negative $\Sigma p(A_j)\log_e p(A_j)$, where $p(A_j)$ is the probability associated with a particular cell. The relative information-transmitted statistic gives an indication of how the four attributes cluster together.

The information transmitted is defined as:
T(level lowinc ethnic group)= H(level) + H(lowinc) + H(ethnic) + H(group) - H(level lowinc ethnic group)

The relative information transmitted for this model (the information transmitted among the four variables is given by :
RT(level lowinc ethnic group)= 4 T(level lowinc ethnic group)/H(level) + H(lowinc) + H(ethnic) + H(group))
Therefore, RT =4(.99226 + .95471 + .89329 + 1.1404 - 3.70892)/(.99226 + .95471 + .89329 + 1.1404)
= .27

B. Asymmetric/Predictor Model:
In this analysis the emphasis was upon examination of the interactions of the level, low-income, and ethnicity variables with the mobility variable. If these interactions add to the model, then they can be considered to be predictors of mobility. As Table 3 shows, all three interactions contribute to the model. The model indicated by the solid line accounts for 95% of the variance of the null model. As before, the G^2 for this model indicates that it is still not a good fit. The addition of higher order interactions, although significant, do not increase the percent of G^2 accounted for enough to warrant inclusion in the model.

Table 3

Predictor Model (asymmetric)

Model	G^2	df	gain G^2	Δ df	%
[group][level lowinc ethnic]	14426.13	132	-	-	-
+ group*ethnic	11604.99	120	2821.14	12	20
+ group*lowinc	10289.72	114	1315.27	6	29
+ group*level	753.84	108	9535.88	6	95
+ group*lowinc*ethnic	597.33	84	156.51	24	96
+ group*ethnic*level	351.84	60	245.49	24	98
+ group*level*lowinc	81.26	48	270.58	12	99
+ group*level*lowinc*ethnic	0	0	81.26	48	100

The relative information statistic here has a slightly different meaning from the one above. The statistic given here indicates the amount of information we have about the group variable when we already know the level, low-income, and ethnicity information. This is analogous to predictability.

The information transmitted to the group variable by the level, lowinc, and ethnic variables is given by:

T(level lowinc ethnic -- group)= H(level lowinc ethnic) + H(group) - H(level lowinc ethnic group)

The relative information transmitted is given by:

RT(level lowinc ethnic -- group)= T(level lowinc ethnic -- group)/ H(group)

Therefore, RT = (2.82709 + .99226 - 3.70892)/ .99226

= .11

Stage 3:

One correspondence analysis ordered the mobility categories based upon low-income status, and another ordered the mobility categories according to ethnicity. Chart 1 shows the results for the low-income

and mobility comparison. Dimension 1 accounted for 99.92% of the total chi-square. The low-income variable scales in the expected order (free, reduced, not eligible) from positive to negative. The mobility variable is ordered B, D, C, and A from positive to negative. Chart 2 shows the results for the ethnicity and mobility comparison. Dimension 1 accounted for 92.69% of the total chi-square. The ethnicity variable was ordered 3 (Black), 4 (Hispanic), and 5 (White/Other) from positive to negative. The American Indian and Oriental categories do not seem to be making a high contribution to dimension 1. The mobility variable is ordered D, C, and A from positive to negative. Category B does not seem to be highly related to dimension 1.

Chart 3 shows the correspondence between low-income status and ethnicity. Again the low-income variable is ordered free, reduced, and not eligible from positive to negative. The ethnicity variable is ordered 3 (Black) and 4 (Hispanic) even with each other, 1 (American Indian), 2 (Oriental), and 5 (White/Other) from positive to negative.

Discussion

The relative information transmitted among the four variables was RT=.27. Although this value might be considered low when compared with variance statistics from other studies, it is of definite practical significance in this study.

Since the mobility variable was of primary interest in this study, some of the methods of analyses were chosen to highlight this variable. All three of the other variables show a relationship with mobility as illustrated by the log-linear predictor model.

Ethnicity:

The analysis of variance and the symmetric log-linear analysis indicate a strong relationship between low-income status and ethnicity. The tendency for minorities to also be low-income students has been verified in other studies and is not new and surprising information. The correspondence analysis (Chart 3) illustrates that the relation between ethnicity and income is fairly strong and unidimensional. The White/Other ethnicity is most closely related to the not eligible for a free or reduced-price lunch category. The Black and Hispanic ethnicities are close to the free-lunch and the reduced-lunch categories.

The symmetric log-linear analysis indicates that the relationship between grade level and ethnicity is not of practical significance. This finding means that the ethnic makeup of the population is not changing much over time.

Mobility:

The most parsimonious log-linear predictor model includes grade level, low-income status, and ethnicity as predictors of the mobility category. It should be noted however, that the relationship between grade level and mobility might be elevated because the longer a student is in school, the higher the chances are that the student will make a move.

There appears to be a strong relationship between low-income status and mobility as illustrated in Chart 1. The stable mobility category is closely associated with the not eligible for free- or reduced-lunch category. The highly mobile category (D) and the category that includes students who have moved during the current year but not in past years (B) is on the same end of the scale as students eligible for free lunches. It is interesting that mobility category B falls outside of the highly mobile versus stable poles (categories A & D). This might be because category B includes many younger students

who are making their first move, coupled with the previously verified fact that as students get older they are more reluctant to take advantage of free or reduced-price lunches even though they are eligible for the service.

The relationship between ethnicity and mobility seems to be less clear and not as unidimensional (see Chart 2). American Indians and Orientals seem to lie outside of the continuum. White/Other students are most closely associated with the stable category. Blacks are more mobile than Hispanics who are also relatively mobile. Category B again lies outside of the continuum.

The relative information transmitted for the prediction model was RT=.11. While fairly low as prediction models go, this shows that the three variables are useful to some extent in predicting and identifying mobile students.

Study 2

Method

In this study individual student mobility was compared to student achievement on a norm-referenced test. Student records over a period of thirteen years were examined. Counts were made of the number of new schools students entered at the beginning of each year. Moves from elementary to middle school, and from middle school to high school were excluded. This study did not examine current year mobility.

The achievement measure was the reading portion of the Iowa Tests of Basic Skills (ITBS) for grade 2, and the Norm-Referenced Assessment Program for Texas (NAPT) for grades 3 to 8.

Analysis

An analysis of variance was used to examine differences in achievement among students with varying numbers of moves. The mobility variable (a count of moves) was again treated as a categorical variable. For each grade from 2nd to 8th, mean grade equivalent scores were compared for each level of mobility. Since the number of students in each cell became small with large numbers of moves, some cells were eliminated in an attempt to satisfy the assumption of equal variance. Some students in lower grades had a high number of moves because they attended early childhood and kindergarten programs.

Results

Table 4 below illustrates that students with higher numbers of moves have lower mean grade equivalents. All F tests were significant ($p < .001$).

Table 4
Mean Grade Equivalents

	Number of Moves (n)					
	0	1	2	3	4	5
Grade						
2	3.33	2.83	2.54	2.58		
	(2705)	(744)	(203)	(36)		
3	4.32	3.90	3.52	3.23		
	(2392)	(926)	(347)	(88)		
4	5.10	4.69	4.23	4.21	3.93	
	(2152)	(960)	(419)	(132)	(32)	
5	6.19	5.85	5.44	5.09	4.75	
	(1780)	(985)	(445)	(209)	(73)	
6	7.09	6.82	6.43	5.97	5.65	5.55
	(1193)	(958)	(719)	(315)	(114)	(40)
7	8.04	7.92	7.46	7.28	6.65	6.21
	(1052)	(906)	(571)	(270)	(111)	(33)
8	9.07	9.15	8.78	8.35	8.16	7.70
	(953)	(847)	(579)	(240)	(93)	(43)

Conclusions

Overall, study 1 establishes that there is a relation among student mobility, income of the students' parents, ethnicity, and the grade level of the student, at least in the school district under study. It is likely that there are other variables that could more accurately identify mobile students other than the relatively cheap (i.e., easy to measure) variables chosen for study 1. The search for more and

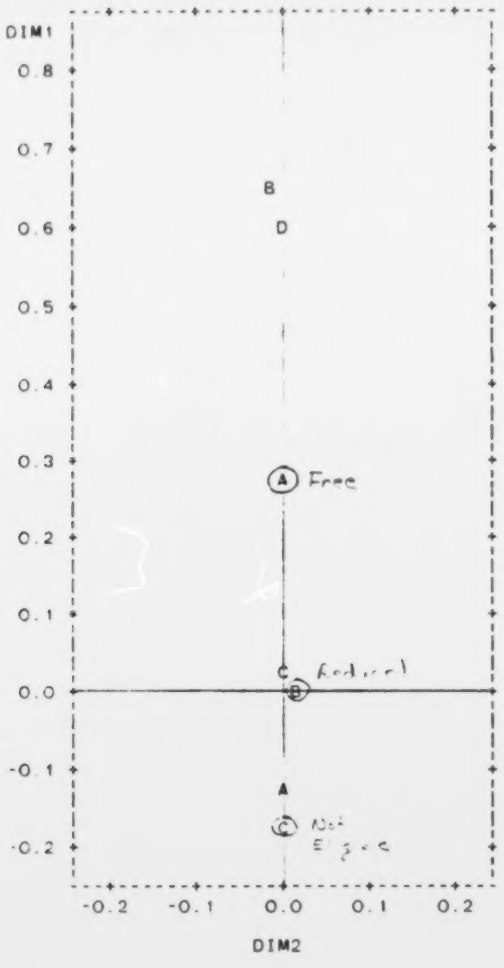
better predictors is one direction that further research in this area might take.

From these results it is clear that early interventions concerning mobile students should be directed toward low-income students, and toward Black and Hispanic students, at least in the school district under study. But more needs to be done to find out who these mobile students are and why they are moving.

It is also clear that there is a relation between student mobility and student achievement. Although study 2 does not establish that mobility causes lower achievement, it does support the idea that mobility is one factor in students' lives that can negatively affect learning.

CHART 1

Lowincome/Mobility



Circled letters are lowincome categories, uncircled letters are mobility categories.

A=Stable
B=Current year move
C=Past year move
D=Current and past year move

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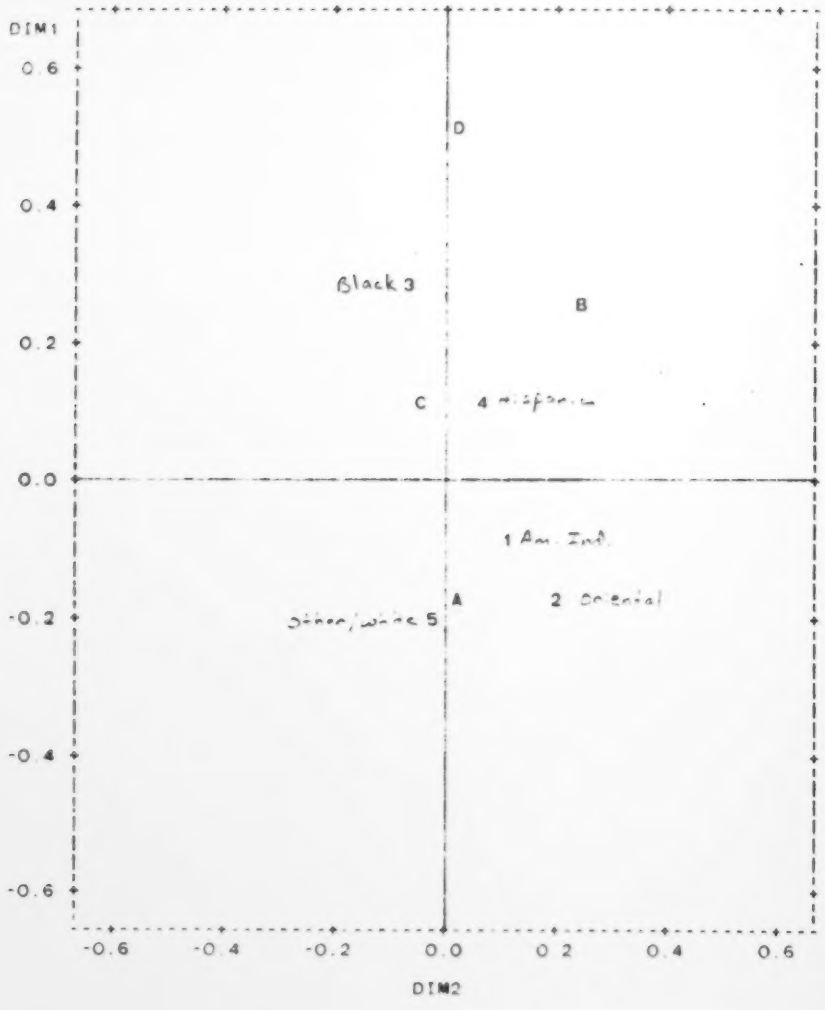
CHART 2

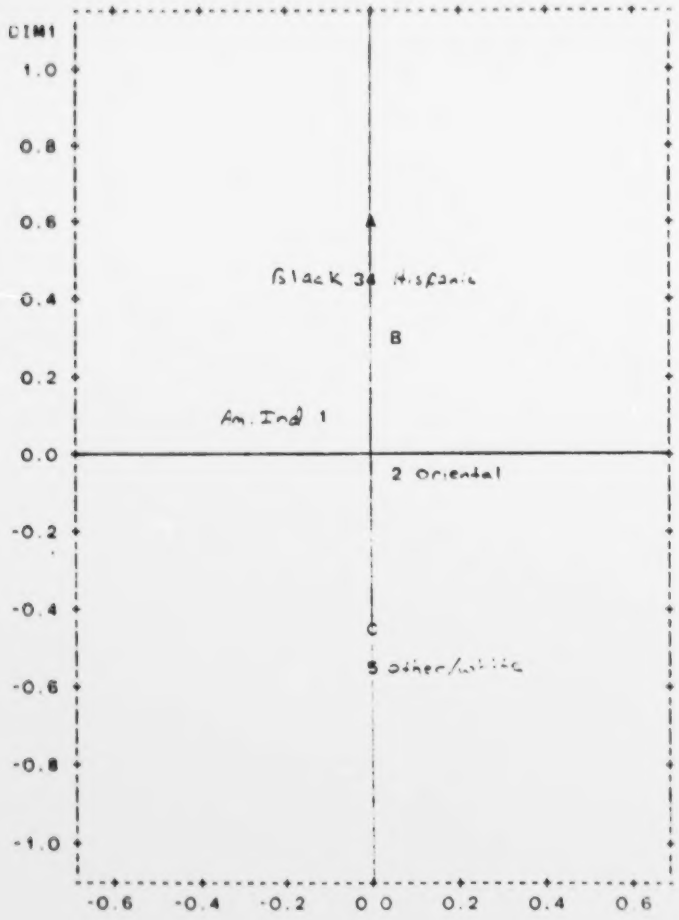
Ethnicity/Mobility



A=stable
B=current year move
C=past year move
D=current and past year move

CHART 3

Ethnicity/Low-income status



A=free lunch
B=reduced price lunch
C=not eligible

Grade 3

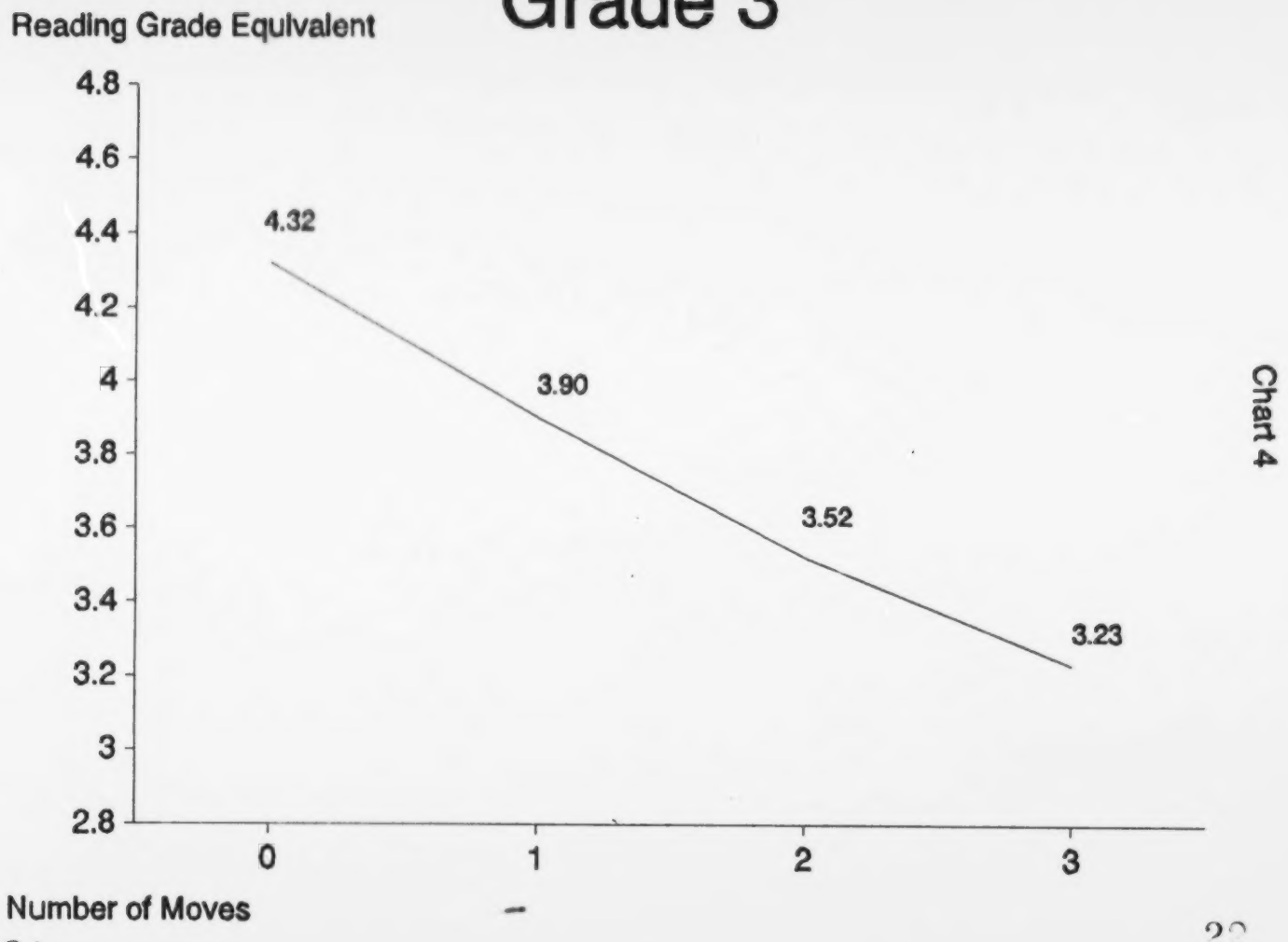


Chart 4

Grade 5

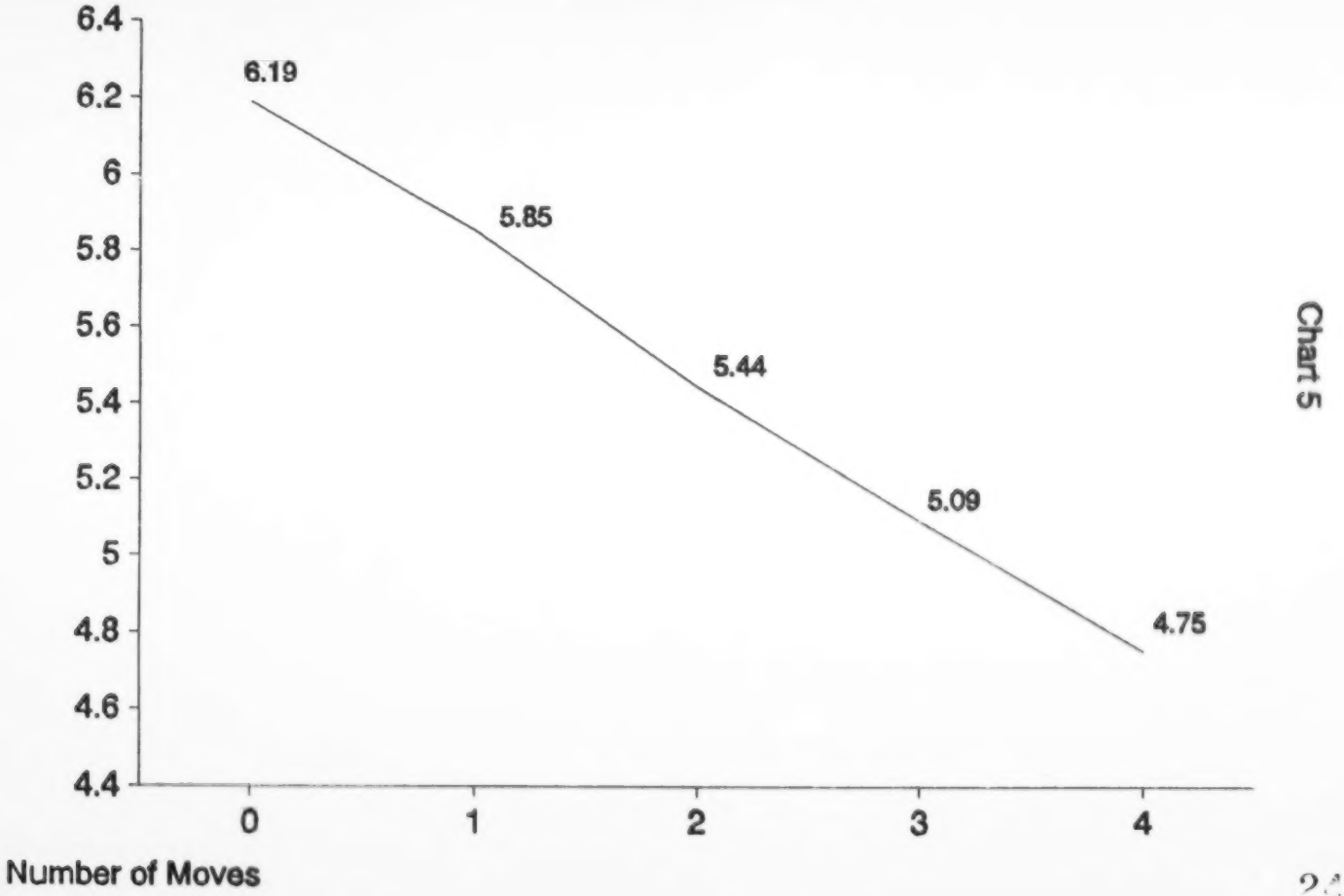


Chart 5

Grade 7

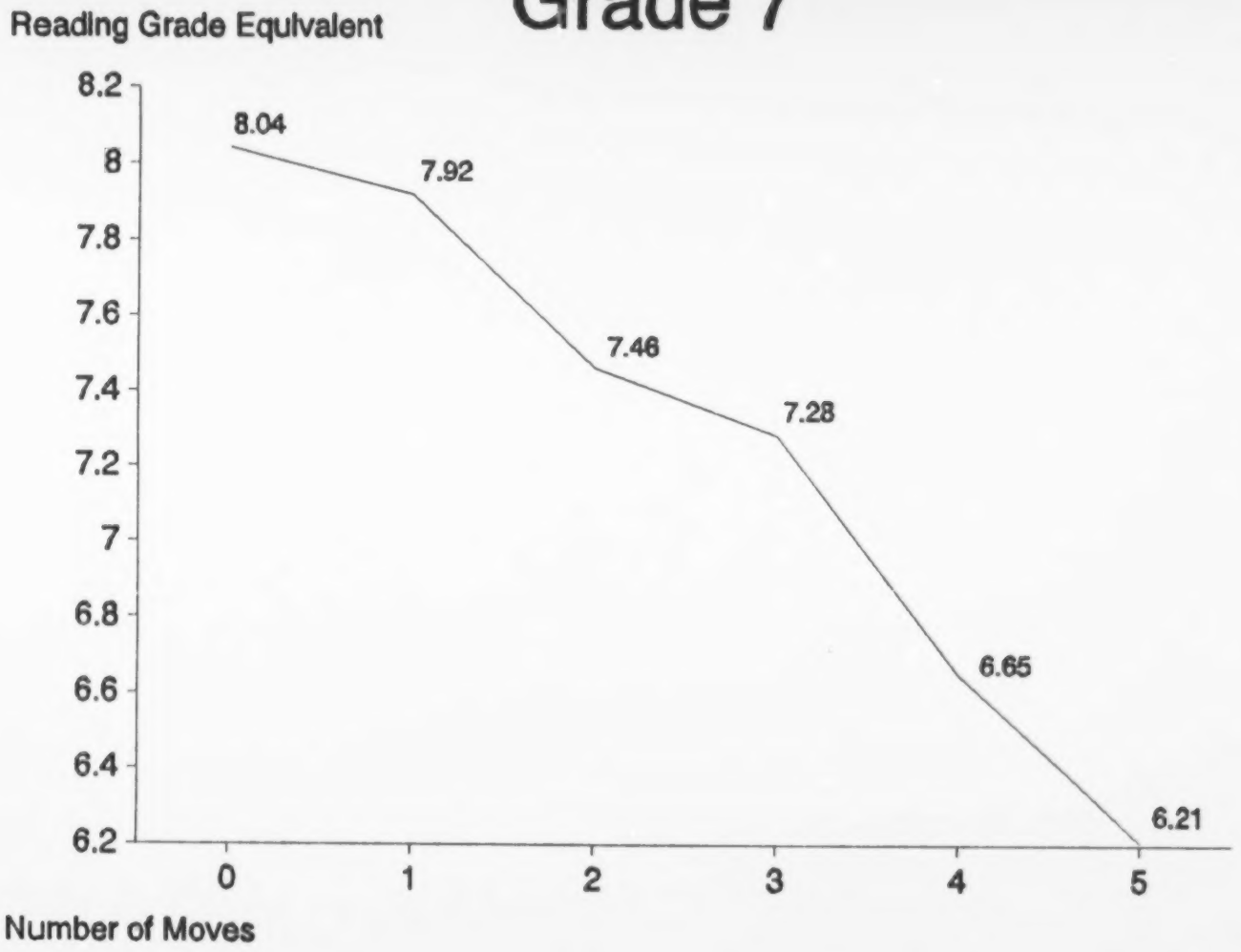


Chart 6